Amendments to the Claims

I. Amendments

Please amend claims 1-3, 5, 7, 14-16, 29-32, 45-48, and 63-66 to read as indicated below.

II. The Claims of the Application

Claim 1. **(Currently Amended)** A method for producing an oligonucleotide-protein conjugate, wherein said method comprises the steps:

(A) contacting an oligonucleotide having an amino group with a heterofunctional linker, wherein said linker has a first group reactive with said amino group and a second group reactive with a thiol group, said contacting being under conditions sufficient to permit said first group of said heterofunctional linker to become bonded to said amino group of said oligonucleotide, thereby forming an oligonucleotide-heterofunctional linker conjugate; and

(B) contacting said oligonucleotide-heterofunctional linker conjugate (A) with a protein having a thiol**ated** group reactive with said second group of said heterofunctional linker; **wherein said thiolated group is formed by thiolation of an amino group of said protein;** said contacting being under conditions sufficient to permit said thiol**ated** group of said protein to become bonded to said second group of said heterofunctional linker of said oligonucleotide-heterofunctional linker conjugate, to thereby form said oligonucleotide-protein conjugate.

Claim 2. **(Currently Amended)** The method of claim 1, wherein said amino group **of said oligonucleotide** is at the 3' end of said oligonucleotide.

Claim 3. **(Currently Amended)** The method of **claim 2** ~~**claim 1**~~, wherein step (A) additionally comprises forming said oligonucleotide having said 3' amino group.

Claim 4. **(Original)** The method of claim 2, wherein said oligonucleotide having said 3' amino group is formed by synthesizing said oligonucleotide on a 3'-amino CPG solid support.

Claim 5. **(Currently Amended)** The method of claim 1, wherein said amino group **of said oligonucleotide** is at the 5' end of said oligonucleotide.

Claim 6. **(Original)** The method of claim 1, wherein step (A) additionally comprises forming said oligonucleotide having said 5' amino group.

Claim 7. **(Currently Amended)** The method of claim 1, wherein said amino group **of said oligonucleotide** is at an internal site of said oligonucleotide.

Claim 8. **(Original)** The method of claim 7, wherein step (A) additionally comprises forming said oligonucleotide having said internal amino group.

Claim 9. **(Original)** The method of claim 1, wherein said modified amino group is C7 CPG.

Claim 10. **(Original)** The method of claim 1, wherein said first group of said heterofunctional linker is an NHS group.

Claim 11. **(Original)** The method of claim 1, wherein said second group of said heterofunctional linker is a maleimide group.

Claim 12. **(Original)** The method of claim 1, wherein said heterofunctional linker is selected from the group consisting of Sulfo-SMCC; Sulfo-EMCS; Sulfo-GMBS; Sulfo-KMUS; Sulfo-MBS; Sulfo-

SIAB; Sulfo-SMPB; Sulfo-LC-SMPT; SVSB; SIACX; SIA, SIAXX; and NPIA.

Claim 13. **(Original)** The method of claim 12, wherein said heterofunctional linker is sulfo-SMCC.

Claim 14. **(Currently Amended)** The method of claim 1, wherein said thiol**ated** group of said protein is derived from an iminothiolane moiety.

Claim 15. **(Currently Amended)** The method of claim 1, wherein step (B) additionally comprises forming said protein having said thiol**ated** group.

Claim 16. **(Currently Amended)** The method of claim 15, wherein said ~~protein~~ **thiolated group** is formed by reacting the amino group of a protein with iminothiolane.

Claim 17. **(Original)** The method of claim 1, wherein said protein is an enzyme, hapten, immunoglobulin, streptavidin, avidin, or a phycobillin protein.

Claim 18. **(Original)** The method of claim 17, wherein said protein is an enzyme.

Claim 19. **(Original)** The method of claim 18, wherein said enzyme is selected from the group consisting of alkaline phosphatase, β-galactosidase, horse radish peroxidase, and urease.

Claim 20. **(Original)** The method of claim 17, wherein said protein is a hapten.

Claim 21. **(Original)** The method of claim 17, wherein said protein is an immunoglobulin.

Claim 22. **(Original)** The method of claim 21, wherein said immunoglobulin is an immunoglobulin that is able to bind to a drug, a receptor, a receptor ligand, or a tumor antigen.

Claim 23. **(Original)** The method of claim 21, wherein said immunoglobulin is able to bind an antigen that is characteristic of a pathogen.

Claim 24. **(Original)** The method of claim 23, wherein said pathogen is a virus.

Claim 25. **(Original)** The method of claim 24, wherein said pathogen is a bacteria or fungus.

Claim 26. **(Original)** The method of claim 17, wherein said protein is a streptavidin protein.

Claim 27. **(Original)** The method of claim 17, wherein said protein is an avidin protein.

Claim 28. **(Original)** The method of claim 17, wherein said protein is a phycobillin protein.

Claim 29. **(Currently Amended)** An oligonucleotide-protein conjugate produced through the process comprising:

(A) contacting an oligonucleotide having an amino group with a heterofunctional linker, wherein said linker has a first group reactive with said amino group and a second group reactive with a thiol group, said contacting being under conditions sufficient to permit said first group of said heterofunctional linker to become bonded to said amino group of said oligonucleotide, thereby forming an oligonucleotide-heterofunctional linker conjugate; and

(B) contacting said oligonucleotide-heterofunctional linker conjugate (A) with a protein having a thiol**ated** group

reactive with said second group of said heterofunctional linker; **wherein said thiolated group is formed by thiolation of an amino group of said protein;** said contacting being under conditions sufficient to permit said thiol**ated** group of said protein to become bonded to said second group of said heterofunctional linker of said oligonucleotide-heterofunctional linker conjugate, to thereby form said oligonucleotide-protein conjugate.

Claim 30. **(Currently Amended)** The oligonucleotide-protein conjugate of claim 29, wherein said amino group **of said oligonucleotide** is at the 3' end of said oligonucleotide.

Claim 31. **(Currently Amended)** The oligonucleotide-protein conjugate of claim 29, wherein said amino group **of said oligonucleotide** is at the 5' end of said oligonucleotide.

Claim 32. **(Currently Amended)** The oligonucleotide-protein conjugate of claim 29, wherein said amino group **of said oligonucleotide** is at an internal site of said oligonucleotide.

Claim 33. **(Original)** The oligonucleotide-protein conjugate of claim 29, wherein said protein is an enzyme, hapten, immunoglobulin, streptavidin, avidin, or a phycobillin protein.

Claim 34. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is an enzyme.

Claim 35. **(Original)** The oligonucleotide-protein conjugate of claim 34, wherein said enzyme is selected from the group consisting of alkaline phosphatase, β-galactosidase, horse radish peroxidase, and urease.

Claim 36. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is a hapten.

Claim 37. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is an immunoglobulin.

Claim 38. **(Original)** The oligonucleotide-protein conjugate of claim 37, wherein said immunoglobulin is an immunoglobulin that is able to bind to a drug, a receptor, a receptor ligand, or a tumor antigen.

Claim 39. **(Original)** The oligonucleotide-protein conjugate of claim 37, wherein said immunoglobulin is able to bind an antigen that is characteristic of a pathogen.

Claim 40. **(Original)** The oligonucleotide-protein conjugate of claim 39, wherein said pathogen is a virus.

Claim 41. **(Original)** The oligonucleotide-protein conjugate of claim 39, wherein said pathogen is a bacteria or fungus.

Claim 42. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is a streptavidin protein.

Claim 43. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is an avidin protein.

Claim 44. **(Original)** The oligonucleotide-protein conjugate of claim 33, wherein said protein is a phycobillin protein.

Claim 45. **(Currently Amended)** A method for determining the presence or concentration of a target nucleic acid molecule in a sample which comprises:

(I) contacting said sample with an oligonucleotide-protein conjugate, wherein a sequence of an oligonucleotide portion of said conjugate is selected to be able to hybridize with said target nucleic acid molecule, wherein said oligonucleotide-protein conjugate is produced through the process comprising:

(A) contacting an oligonucleotide having an amino group with a heterofunctional linker, wherein said linker has a first group reactive with said amino group and a second group reactive with a thiol group, said contacting being under conditions sufficient to permit said first group of said heterofunctional linker to become bonded to said amino group of said oligonucleotide, thereby forming an oligonucleotide-heterofunctional linker conjugate; and

(B) contacting said oligonucleotide-heterofunctional linker conjugate (A) with a protein having a thiol**ated** group reactive with said second group of said heterofunctional linker; **wherein said thiolated group is formed by thiolation of an amino group of said protein;** said contacting being under conditions sufficient to permit said thiol**ated** group of said protein to become bonded to said second group of said heterofunctional linker of said oligonucleotide-heterofunctional linker conjugate, to thereby form said oligonucleotide-protein conjugate;

(II) detecting a protein portion of any of said oligonucleotide-protein conjugate having an oligonucleotide portion hybridized to said target nucleic acid molecule; wherein said detection determines the presence or concentration of said target nucleic acid molecule in said sample.

Claim 46. **(Currently Amended)** The method of claim 45, wherein said amino group **of said oligonucleotide** is at the 3' end of said oligonucleotide.

Claim 47. **(Currently Amended)** The method of claim 45, wherein said amino group **of said oligonucleotide** is at the 5' end of said oligonucleotide.

Claim 48. **(Currently Amended)** The method of claim 45, wherein said amino group **of said oligonucleotide** is at an internal site of said oligonucleotide.

Claim 49. **(Original)** The method of claim 45, wherein said protein of said oligonucleotide-protein is an enzyme, hapten, immunoglobulin, streptavidin, avidin, or a phycobillin protein.

Claim 50. **(Original)** The method of claim 49, wherein said protein is an enzyme.

Claim 51. **(Original)** The method of claim 50, wherein said enzyme is selected from the group consisting of alkaline phosphatase, β-galactosidase, horse radish peroxidase, and urease.

Claim 52. **(Original)** The method of claim 49, wherein said protein is a hapten.

Claim 53. **(Original)** The method of claim 49, wherein said protein is an immunoglobulin.

Claim 54. **(Original)** The method of claim 53, wherein said immunoglobulin is an immunoglobulin that is able to bind to a drug, a receptor, a receptor ligand, or a tumor antigen.

Claim 55. **(Original)** The method of claim 53, wherein said immunoglobulin is an immunoglobulin that is able to an antigen that is characteristic of a pathogen.

Claim 56. **(Original)** The method of claim 55, wherein said pathogen is a virus.

Claim 57. **(Original)** The method of claim 55, wherein said pathogen is a bacteria or fungus.

Claim 58. **(Original)** The method of claim 45, wherein said target nucleic acid molecule is a nucleic acid molecule of a pathogen.

Claim 59. **(Original)** The method of claim 45, wherein said target nucleic acid molecule is a nucleic acid molecule of a tumor cell.

Claim 60. **(Original)** The method of claim 49, wherein said protein is a streptavidin protein.

Claim 61. **(Original)** The method of claim 49, wherein said protein is an avidin protein.

Claim 62. **(Original)** The method of claim 49, wherein said protein is a phycobillin protein.

Claim 63. **(Currently Amended)** A method for determining the presence or concentration of a target analyte in a sample which comprises:

(I) contacting said sample with an oligonucleotide-protein conjugate, wherein a protein portion of said conjugate is selected to be able to bind to said target analyte, wherein said oligonucleotide-protein conjugate is produced through the process comprising:

(A) contacting an oligonucleotide having a 3' amino group with a heterofunctional linker, wherein said linker has a first group reactive with said 3' amino group and a second group reactive with a thiol group, said contacting being under conditions sufficient to permit said first group of said heterofunctional linker to become bonded to said 3' amino group of said oligonucleotide, thereby forming an oligonucleotide-heterofunctional linker conjugate; and

(B) contacting said oligonucleotide-heterofunctional linker conjugate (A) with a protein having a thiol**ated** group reactive with said second group of said heterofunctional linker; **wherein said thiolated group is formed by thiolation of an amino group of said protein;** said contacting being under conditions sufficient to permit said thiol**ated** group of said protein to become bonded to said second group of said heterofunctional linker of said oligonucleotide-heterofunctional linker conjugate, to thereby form said oligonucleotide-protein conjugate;

(II) detecting an oligonucleotide portion of any of said oligonucleotide-protein conjugate having a protein portion bound to said target analyte; wherein said detection determines the presence or concentration of said target analyte in said sample.

Claim 64. **(Currently Amended)** The method of claim 63, wherein said amino group **of said oligonucleotide** is at the 3' end of said oligonucleotide.

Claim 65. **(Currently Amended)** The method of claim 63, wherein said amino group **of said oligonucleotide** is at the 5' end of said oligonucleotide.

Claim 66. **(Currently Amended)** The method of claim 63, wherein said amino group **of said oligonucleotide** is at an internal site of said oligonucleotide.

Claim 67. **(Original)** The method of claim 63, wherein said protein of said oligonucleotide-protein is an enzyme, receptor or receptor ligand.

Claim 68. **(Original)** The method of claim 67, wherein said protein is an enzyme.

Claim 69. **(Original)** The method of claim 67, wherein said protein is a receptor.

Claim 70. **(Original)** The method of claim 67, wherein said protein is a receptor ligand.

Claim 71. **(Original)** The method of claim 67, wherein said protein is a tumor antigen.

Claim 72. **(Original)** The method of claim 53, wherein said protein is characteristic of a pathogen.

Claim 73. **(Original)** The method of claim 72, wherein said pathogen is a virus.

Claim 74. **(Original)** The method of claim 72, wherein said pathogen is a bacteria or fungus.